

## PRESENT STATUS OF SEMICONDUCTOR INDUSTRY IN INDIA & IT'S FUTURE PROSPECTS

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### Abstract

*Semiconductor is now an inseparable part of almost all sectors. Nowadays semiconductors or chips / integrated circuits (ICs) are the lifeblood of all digital Products. Industry estimates are that India's demand for semi - conductor goods will reach US \$ 400 billion by FY 2025.*

*Taiwan's TSMC and South Korea's Samsung manufacture as much as 70% of the world's semiconductors. America only makes about 10% of the chips it uses. According to Global data, the semiconductor industry is facing an unprecedented supply shortage since the end of the year 2019 due to unprecedented demand growth. The government's plan to promote Semiconductor manufacturing may have a bright future for Indian semiconductor Industry. The government will seek to incentivise startups to design and make semiconductors. India imported \$ 3.14 bn in semiconductor Devices in 2019.*

*Semiconductor world market has to grow by \$ 90.80 bn during 2020 - 2024. India can take it's pie in this opportunity. India has to develop an ecosystem. Capital expenditure is required to expand production to address the rising chip demand. Setting up a new foundry can cost anywhere around \$ 15 bn - \$ 20 bn. Amid challenges Technology influx such as artificial intelligence, 5G wireless, IOT and cloud computing will remain key factors for rampant growth of semiconductors Industry in India.*

**Key Words:** *Integrated Circuits (ICs), Internet Of Things (IOT), Electronic System Design Manufacturing (ESDM)*



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### Introduction:

Semiconductor is now an inseparable Part of almost all sectors. That is why semiconductor Industry has emerged as one of the most important industries in India. Nowadays semiconductors or chips/integrated circuits (ICs) are the lifeblood of all digital products. Industry estimated are that India's demand for semi - conductor goods will reach

US \$ 400 billion by FY 2025. The end use industries such as mobile devices, telecommunication equipment, information technology, office automation, Industrial machinery, automobiles and several other industries have applications for computing in some form or the other and thereby necessarily have growing demand for semiconductors. Now the concept of Internet of Things (IOT) picking up momentum. The next generation of interconnected devices would further increase the demand for intelligent computing, thereby creating sustainable demand for semiconductors. India has a very fast growing electronics system design manufacturing (ESDM) Industry. India also has a very strong design base. India has become the hub for semiconductor design with nearly 2000 chips being designed per year and more than 20,000 engineers are working in various aspects of chip design and verification.

Semiconductor industry is basically divided into two parts, which deals with designing and fabrication part, also called the semiconductor foundry, where the final microchip is manufactured. Within semiconductor design, there is very large scale integration (VLSI) design, embedded software and electronic design automation (EDA).

In India VLSI holds the biggest chunk in India semiconductor design Industry.

### **World Scenario**

As it has been made apparent by now the vast majority of manufacturing is being carried out by two companies in East Asia - Taiwan's TSMC and South Korea's Samsung. These foundaries manufacture as much as 70% of the world's semiconductors. Within the Asia Pacific region alone, china, Japan, South Korea and Taiwan together have become the big 4 semiconductor Players, holding four of the top six spots by overall semiconductor revenue. The region is also the world's biggest market for semiconductor's accounting for 60% of global semiconductors sales, within which china alone accounts for over 30%. America only makes about 10% of the chips it uses, according to Global Data. while VLSI is big in Bengaluru, Noida holds the biggest chunk of EDA operations happening in India.

### **Market Size & Present Status**

The semiconductor Industry is facing an unprecedented supply shortage since the end of last year due to unprecedented demand growth. Speaking at the computex 2021 trade show, Intel's global chief executive Pat Gelsinger said the Pandemic has led to a cycle of explosive growth, which has placed significant strain on supply chains.

The government's is plan to promote semiconductor manufacturing may have a bright future. The country's trajectory for all forms of semiconductor devices is enormous. The government has been working on a scheme to boost local manufacturing of semiconductors. Companies such as Intel, are expected to be among it's top targets. The government will offer \$ 1 billion in cash to each company for setting up semiconductor manufacturing units, according to a March report by Reuters. Prakash Mallya, Vice President and managing director, sales, marketing and communication group, Intel Technology India Pvt. Ltd, said it may take years for the ecosystem to be fully built, but he is optimistic considering the opportunity that India Presents.

The central cabinet has cleared the Rs. 76000/- cr incentive scheme for semiconductors on 15 Dec. 2021. Under this scheme, India will set up more than 20 semiconductors design, components manufacturing and display fabrication (Fab) units over the next six years. This is part of Modi Government's bid to make the country a hub for electronics. The nod comes almost a year after the government sought expressions of interest from companies to this effect. The ministry of electronics & IT (MeritY) will now work out on details and invite applications. The new semiconductor Policy will help deepen India's manufacturing base. The scheme has been named the "Programme for Development of Semiconductors and Display Manufacturing Ecosystem". As part of the scheme, the government will seek to incentivise startups to design and make semiconductors. Investments worth Rs. 170,000 crores are expected to materialise in the near future. The plan envisages training of 85000 semiconductor engineers to make it a complete C to S (Chips to Startups) ecosystem (Including design, fabrication, testing and Packaging). Telecom and IT Minister Ashwini Vaishnaw also elaborated on a new design linked incentive (DLI), of which 50 % of the cost will be borne by the government. The government's target as of now includes are two fab units for displays and 10 units each for designing and Producing components. The Industry is expected to generate 35000 high - quality jobs and indirect employment for one lakh people.

Global industry is currently reeling from an acute shortage of semiconductor chips, which has caused production processes worldwide to go hay wire and prices to jump. Semiconductors chips are used in making a wide range of products ranging from cars to phones very recently, their supply has been severely disrupted due to a host of reasons, causing a crises in a number of industries including automobiles and gadgets. Many other

everyday - use items such as TVs, laptops, washing Machines, Invertors, watches and many more need semiconductors.

Fabs of companies such as Tiwan Semiconductor Manufacturing company, Micron Technology design and produce semiconductor wafers to cater to demands from global chipmaking biggies such as samsung, Qualcomm, etc. Thereafter, these chipmakers test, Package and sell the chips to gadget makers like cisco systems, and Xiaomi.

### **Future Prospects:**

Process has began for India to begun as a semiconductor giant. India has the requisite expertise in software and design. Initiatives taken by the government of India to promote this sector are expected to spur the market in the coming years. India can take the lead in electronic system design and electronic product manufacturing.

According to a report by NOVONOUS, the semiconductor industry is estimated to grow from US \$ 10.02 billion in 2013 to US \$ 52.58 billion in 2020 at a Compound Annual Growth Rate (CAGR) of 26.72 percent. Further the telecommunication segment is also expected to grow at a high CAGR of 26.8 percent between 2013 to 2020. Presently following are the top 10 semiconductors manufacturing facilities are working in India:

Applied Materials

TSMC India

Micron Technology

Solex Energy Limited

Masamb Electronics

Semtronics Micro Systems

Samsung Semiconductor India

Broadcom

India imported \$ 3.14 B in Semiconductor Devices in 2019, becoming the 11th largest importer of Semiconductor Devices in the world. At the same year, Semiconductor Devices was the 17th most imported product in India. The demand for semiconductor in India is valued at over US \$ 10 billion. The Indian Semiconductor design market was projected to grow by a CAGR of 29.4 percent from US \$ 14.5 billion in 2015 to US \$ 52.6 billion in 2020.

Semiconductor world market has to grow by \$ 90.80 bn during 2020 - 2024. India can take its Pie in this opportunity.

According to the Takshashile report, more than 3000 chips are designed annually by Indian engineers. Most of these are created in research and design houses of major global firms in India, such as Broadcom, Huawei Technologies co, Qualcomm and Samsung. Global semiconductor sales increase 24% year - on - year. Annual sales projected to increase 26% in 2021, Exceed \$ 600 billion in 2022.

### **Key Challenges of Semiconductor Industry**

The Semiconductor industry is not evenly distributed and is dominated by a few players, mainly U.S. , Taiwan, south Korea, Japan, China and Europe. There is no single region with the entire production chain in its territory. As per American Semiconductor Industry Association, 57 % of the semiconductor materials, 56 % of wafer fabrications, and 70 % of the memory come from Asian Countries. The U.S. leads the way in electronic design automation (EDA), Logic, equipment, discrete and analog. This deep interdependence makes it difficult for any single country to maintain leadership in the entire value chain globally.

The current trade tensions between the U.S. and China are likely to impact chip production in Taiwan. TSMC, which is the world's largest contract chipmaker, cited in its annual report that the trade wars between the two countries could raise prices higher. Since TSMC gets most of its supplies from the U.S., the company may face challenges in procurement of raw materials for production. Making semiconductors is a complex process and comes with huge costs. The foundries and outsource assembly and testing (OSAT) companies are likely to face increased pressure on capital expenditures as they continue to expand production to address the rising chip demand. Setting up a new foundry can cost anywhere around \$ 15 bn - \$ 20 bn and require extensive manufacturing know - how and robust infrastructure to operate. The back - end facilities for assembly, Packaging and testing also require an additional investment of \$ 5 bn to \$ 7 bn. Firms invest a significant portion of their revenue on capital expenditures and R & D. As per industry estimate, the world collectively require to invest \$ 3 trillion in R & D over the next decade to keep pace with the growing demand. The total R & D spend throughout the industry amounted to \$ 92 billion in 2019. Intel, Qualcom, Samsung and TSMC are the largest investors in the chip industry.

### **Conclusion:**

To Conclude, the semiconductor industry is poised for significant growth in 2021 and onward, post it's recovery from a cyclical downturn. Technology influx, such as artificial intelligence, 5G wireless, Internet of Things (IOT), cloud computing and machine learning

and driving up the long - term demand for the chip industry, increased government funding and incentives will remain key factors for its rampant growth going onward.

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